

WHAT IS CLAIMED IS:

- 1 1. A male die, comprising:
  - 2 a plurality of first forging punches, each of which is operable to form a
  - 3 first recess on a metal plate, the first forging punches arranged at a fixed pitch
  - 4 to form a punch row in a first direction; and
  - 5 a plurality of second forging punches, each of which is operable to
  - 6 form a second recess on the metal plate, the second forging punches arranged
  - 7 adjacently to first forging punches located at both ends of the punch row,
  - 8 wherein the first recess is to have a first function, and the second
  - 9 recess is to have a dummy function in connection with the first function.
- 1 2. The male die as set forth in claim 1, wherein a plurality of second  
2 forging punches are provided at each end of the punch row.
- 1 3. The male die as set forth in claim 1, wherein a depth dimension of a  
2 first gap defined between adjacent ones of the first forging punches and the  
3 second forging punches is smaller than a depth dimension of a second gap  
4 defined between adjacent ones of the first forging punches.
- 1 4. The male die as set forth in claim 3, wherein a depth dimension of a  
2 third gap defined between adjacent ones of the second forging punches is  
3 smaller than the depth dimension of the first gap.

1 5. The male die as set forth in claim 4, wherein the depth dimension of  
2 the third gap defined between adjacent ones of the second forging punches  
3 which are closer to the end of the punch row is smaller than the depth  
4 dimension of the third gap defined between adjacent ones of the second  
5 forging punches which are further from the end of the punch row.

1 6. The male die as set forth in claim 1, wherein each of the first forging  
2 punches and each of the second forging punches are elongated in a second  
3 direction which is perpendicular to the first direction.

1 7. The male die as set forth in claim 1, wherein a width dimension of  
2 each of the first forging punches is smaller than a width dimension of each of  
3 the second forging punches.

1 8. The male die as set forth in claim 3, wherein a width dimension of  
2 each of the first forging punches is identical with a width dimension of each of  
3 the second forging punches.

1 9. The male die as set forth in claim 1, wherein the second forging  
2 punches are extended closer to the metal plate to be processed than the first  
3 forging punches.

1 10. The male die as set forth in claim 1, further comprising a plurality of  
2 third forging punches, each of which is operable to form a third recess on the  
3 metal plate and arranged between one of the first forging punches and one of

4 the second forging punches, wherein:  
5 a width dimension of each of the first forging punches is identical with  
6 a width dimension of each of the third forging punches; and  
7 the third recess is to have the dummy function.

1 11. The male die as set forth in claim 1, wherein the fixed pitch is 0.3mm  
2 or less.

1 12. The male die as set forth in claim 1, wherein:  
2 the metal plate is to be a member incorporated in a liquid ejection  
3 head; and  
4 the first recess is to be a first part of the member which is used to  
5 eject liquid from the liquid ejection head, and the second recess is to be a  
6 second part of the member which is not used to eject liquid.

1 13. A liquid ejection head, comprising:  
2 a first metallic plate member, formed with:  
3 a plurality of first recesses, arranged at a fixed pitch to form a  
4 recess row; and  
5 a plurality of second recesses, arranged adjacently to first recesses  
6 located at both ends of the recess row; and  
7 a second metallic plate member, joined to the first metallic plate  
8 member, and formed with a plurality of nozzle orifices each communicated with  
9 one of the first recesses and operable to eject liquid therefrom by pressure  
10 fluctuation generated in liquid contained in the one of the first recesses,

11 wherein a shape of each of the first recesses is different from a shape  
12 of each of the second recesses.

1 14. The liquid ejection head as set forth in claim 13, wherein a plurality of  
2 second recesses are provided at each end of the recess row.

1 15. The liquid ejection head as set forth in claim 14, wherein adjacent  
2 ones of the second recesses are partly communicated with each other.

1 16. The liquid ejection head as set forth in claim 13, wherein a width  
2 dimension of each of the first recesses is smaller than a width dimension of  
3 each of the second recesses.

1 17. The liquid ejection head as set forth in claim 15, wherein a width  
2 dimension of each of the first recesses is identical with a width dimension of  
3 each of the second recesses.

1 18. The liquid ejection head as set forth in claim 13, wherein a depth  
2 dimension of each of the first recesses is smaller than a depth dimension of  
3 each of the second recesses.

1 19. The liquid ejection head as set forth in claim 13, wherein:  
2 the first metallic plate member is formed with a plurality of third  
3 recesses each arranged between one of the first recesses and one of the  
4 second recesses;

5           a width dimension of each of the first recesses is identical with a width  
6   dimension of each of the third recesses; and  
7           the third recesses are not so configured as to eject liquid from the  
8   nozzle orifices.

1   20.     The liquid ejection head as set forth in claim 13, wherein the fixed  
2   pitch is 0.3mm or less.

1   21.     A method of manufacturing a liquid ejection head, comprising steps  
2   of:  
3           providing a first metallic plate member;  
4           providing the male die comprising a plurality of first forging punches  
5   arranged at a fixed pitch to form a punch row, and a plurality of second forging  
6   punches arranged adjacently to first forging punches located at both ends of  
7   the punch row;  
8           forming simultaneously a plurality of first recesses with the first  
9   forging punches and a plurality of second recesses with the second forging  
10   punches;  
11          providing a second metallic plate member formed with a plurality of  
12   nozzle orifices; and  
13          joining the first metallic plate member and the second metallic  
14   member such that each of the nozzle orifices is communicated with one of the  
15   first recesses,  
16          wherein a shape of each of the first recesses is different from a shape  
17   of each of the second recesses.

- 1 22. A forging apparatus comprising the male die as set forth in claim 1.